



Production and Management of Old World Bluestems

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Much of the cropland in Oklahoma is poorly suited to grain production because the soils are low in fertility and highly erodible. These factors, coupled with unfavorable economics of wheat production, have prompted some producers to search for other uses for these lands. The establishment of permanent forages for beef pasture appears to be a promising alternative. In the past, these areas were revegetated with native range mixtures, weeping lovegrass or bermudagrass. In recent years, however, producer interest in a group of grasses known collectively as Old World bluestems, has increased greatly.

Introduced Grasses

Old World bluestems include several species of warm-season grasses that were introduced from Europe and Asia from 1920-1965. These grasses have been studied extensively in Oklahoma for the last 40 years, but producer interest was not widespread until quite recently.

Old World bluestems are warm-season bunchgrasses that possess good forage potential for the southern Great Plains. These grasses respond well to fertilization, are drought and cold tolerant for the most part, withstand close grazing, and are palatable to cattle. Old World bluestems are not closely related to the native big and little bluestem grasses found throughout Oklahoma.

The six most common cultivars for use in Oklahoma include: 'Caucasian', 'Ganada', 'King Ranch', 'Plains', 'WW-Spar' and 'WW-Iron Master'. Caucasian and King Ranch have been commercially available for over 20 years, whereas Plains, Ganada, WW-Spar and Iron Master are more recent releases. A comparison of the different cultivars is found in Table 1.

Stand Establishment

Old World bluestems are best adapted to loam or clay-loam soils. Stand establishment on sandy or sandy-loam soils is more risky, but usually can be obtained. Seeding should be on a firm seedbed either by broadcasting the seed or planting at shallow depths (1/4" or less). Seeding rates of 1 to 3 pounds pure live seed per acre are generally recommended. The best results have been obtained when seeding was done with a drill specifically designed to handle "fluffy" grass seeds. Recent developments in seeding, such as using the bare, "caryopses" and lo-till planting into "grazed-out" wheat, warrant attention for future plantings. More specific information on the establishment of Old World bluestems can be found in OSU Extension Fact Sheet F-2581 - Reseeding Marginal Cropland to Perennial Grasses.

Oklahoma Cooperative Extension Fact Sheets
are also available on our website at:
<http://osufacts.okstate.edu>

Table 1. Characteristics of different Old World Bluestems.

Name	Origin	Area of Adaption	Remarks
Caucasian	Russia	Statewide	Most productive, winter hardy, slightly less palatable
Ganada	Russia	Western 1/3, high plains	Good drought tolerance, good forage quality
King Ranch	China	Extreme southern counties	Most palatable, but easily winter killed and susceptible to rust
Plains	Asia	Statewide	Most popular, very adaptable, longer grazing season
WW-Spar	Pakistan	Statewide	Winter hardy, most drought tolerant
WW-Iron Master	Afghanistan	Western 1/3 high plains	Better adapted to soils with iron deficiency

Forage Yields

Forage yields from Old World bluestems will range from 1 to 5 tons/acre on dryland sites depending on the cultivar, fertility program, soil type, and growing conditions. Generally, 2 to 3 tons/acre of forage can be expected in most years. Several studies have shown Caucasian to be the most productive cultivar, usually producing 10 to 20% more forage than other cultivars under favorable soil moisture conditions (Table 2). Yields of Plains, Ganada, and WW-Spar tend to be similar, but greater than King Ranch. WW-Iron Master will produce fewer seed heads and stems than WW-Spar or Plains so seed production will be less and the price will be higher.

Old World bluestems respond very favorably to nitrogen fertilization (Table 3). Studies show that 20 to 50 pounds of additional forage will be produced for each pound of actual nitrogen added. A single application of 60 pounds of N/acre in April is as effective or in some years more effective than split applications (Table 4). Higher rates of nitrogen are appropriate in eastern Oklahoma and on irrigated sites. Generally, fertilizer should not be added after September 1, as this can result in excess growth just prior to a killing frost which may contribute to plant kill during winter. In addition to improving forage yields, nitrogen fertilization will also improve crude protein content of the forage by 2 to 5 percentage points.

Table 2. Forage yields (pounds/acre/year of dry matter) from Old World Bluestems.

Location	Dates	Cultivar	Yield	% of Plains
Ardmore	1980-83	Caucasian	8,000	134
		Ganada	6,100	103
		Plains	6,000	100
		WW-Spar	5,100	86
Mangum	1969-70	Plains	4,100	100
		King Ranch	2,700	66
Perkins	1969-71	Caucasian	12,200	120
		King Ranch	6,600	65
		Plains	10,200	100
Woodward	1979-81	Caucasian	7,900	136
		Plains	5,800	100
		WW-Spar	6,900	119

Table 3. Forage yields (pounds/acre of dry matter) as affected by nitrogen fertilization.

Location	Dates	Nitrogen [*] Cultivar	Forage Rate	Lbs. Forage Yield	per lb.N
Ardmore	1976-77	Plains	0	2,900	—
			100	6,800	39
			200	8,900	30
Stillwater	1968-71	Plains	0	2,400	—
			50	4,400	40
			100	5,400	30
Woodward	1963-65	Caucasian	0	3,000	—
			33	3,700	21
Woodward	1982	WW-Spar	0	1,100	0
			30	2,400	43
			60	3,300	37

* Pounds actual N per acre.

Grazing Season

Old World bluestems typically begin growth in late-April. As with other warm-season grasses, most of the forage production from Old World bluestems occurs by mid-July (Fig. 1). However, these introduced bluestems are more responsive to late-summer and fall precipitation than are the native grasses. As such, substantial regrowth can occur in August and September when moisture is available. In general, Caucasian and WW-Spar attain peak production earlier in the summer than does Plains. Plains is a mixture of 30 different varieties each maturing at slightly different times, thus a longer green grazing season is present than in the other cultivars.

Forage Quality and Palatability

Several factors influence forage quality, including stage of growth, species of grass, and soil fertility. All warm-season grasses, including Old World bluestems, are highest in forage quality (crude protein and digestibility) in early summer (May-June) when new plant growth is most available. After mid-July, forage quality declines rapidly until fall, after which time forage quality remains rather constant (Figure 2). By manipulating stage of growth, either by grazing or haying, forage quality at levels suitable for beef production can be maintained throughout most of the summer.

Old World bluestems offer higher quality forage during late-summer (July to August) than grasses like bermudagrass, weeping lovegrass, or tallgrass native range (big bluestem, switchgrass, indiagrass, and little bluestem). Old World bluestem is similar in quality during late summer to short and midgrass native range, (buffalograss, blue gama, and sideoats grama). Limited grazing trials with stocker cattle at

Table 4. Applied nitrogen fertilizer recovered as plant-N from Old World Bluestem forage over 5 harvest seasons as affected by N fertilization rates on Woodward sandy loam.

Year	N Applied lbs/ac/yr				
	0	30	60	60(split)	90
	lbs N/acre recovered				
1982	13	31	49	45	67
1983	4	18	31	22	27
1984	4	18	22	13	27
1985	9	22	40	40	58
1986	4	9	22	18	22
Ave. Recov. %	—	19	33	28	40

Berg, W.A., J. Range Mngt. 43:265-270

Haskell suggests that gains from July through August were higher on Plains than 'Midland' bermudagrass at similar fertility levels. Studies at Woodward indicate that steer gains from Old World bluestems were higher in late-summer than from either native range or weeping lovegrass. Studies at the Marvin Klemme Research Range near Cordell indicate short and mid-grass native range equals or exceeds "Old World" bluestem forage quality from September through the fall. Native range was preferred for wintering cattle. Generally, forage from "Old World" bluestems meets or exceeds recommended requirements for animal growth from May to July 15, but additional protein supplementation may be necessary during other periods, especially with stocker animals (Fig. 2).

All of the commercially available Old World bluestems are similar in forage quality. Digestibilities typically range from 50 to 60% and crude protein content varies from 4 to 13%, depending primarily on the stage of growth of the grass. Studies have shown that Caucasian may be slightly less digestible (1 to 3 percentage points lower) than Plains or WW-Spar, however the additional forage yields obtained from Caucasian probably offset such minor difference in forage quality.

Beef Production

Stocker gains on Old World bluestems range from 1 to 2 pounds/day during summer and from 0.1 to 0.5 pounds/day during winter (Table 5). Stocker gains can exceed 2 pounds/day from early-May to mid-July when forage quality is highest, but gains tend to drop off during late-summer unless additional protein supplementation is available. Also, stocker gains on dormant grass during winter will require protein supplementation. Because cows have lower protein requirements than

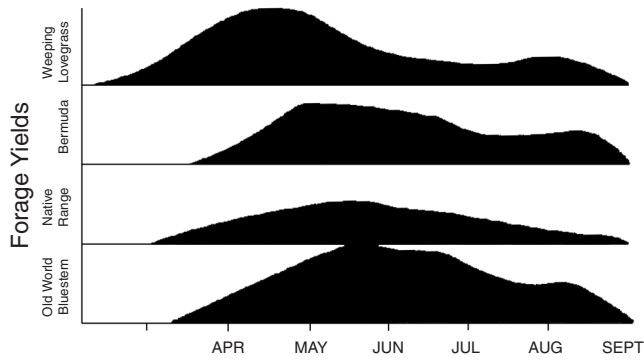


Figure 1. Generalized seasonal forage production of four warm-season grasses.

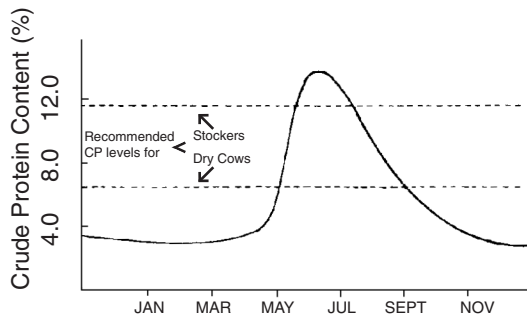


Figure 2. Seasonal crude protein content of Old World Bluestems.

stockers, Old World bluestems can provide most of the necessary nutrients for a longer period of time for cows than for stockers. However, additional protein will still be necessary during winter and possibly other times, depending on the physiological condition of the cow (i.e., lactating, late-pregnancy, etc.)

Cattle gains from Old World Bluestem on old cropland sites are often higher than gains from upland native range sites because of differences in soils and the addition of purchased fertilizer. Stocking rates on Old World will vary from 1 steer per 3 acres for the growing season in western Oklahoma to about 1 steer per acre in central and eastern Oklahoma. At these stocking rates, beef production can reach 200 pounds per acre on cropland sites with good fertility and moisture (Table 5.)

Stocking rates should be based on forage availability (Table 6.). Stocking rates will vary from year to year depending on rainfall. Stocking rates can be increased by 10 to 25% by using rotational grazing as opposed to continuous, season long grazing.

Hay Production and Value

Limited studies have been conducted on the value of Old World bluestem hay. These studies indicated that, when properly fertilized and harvested at the appropriate stage of growth, high yields of good quality hay (10 to 16% crude protein) can be obtained. Caucasian, WW-Spar and Plains bluestem stands have produced as much as 3 to 4 tons of hay/ acre with an in-vitro dry matter digestibilities of 57, 61, and 60 percent,

Table 5. Gains of yearling steers grazing 'Caucasian' and 'Plains' bluestem between 1977 and 1983 and 'WW-Spar' bluestem between 1981 and 1983 at the Southern Plains Experimental Range¹.

Item	Cultivar		
	Caucasian	Plains	WW-Spar
Average daily gain (lbs/hd/day)			
Winter	0.38	0.40	0.52
Summer	1.73	1.66	1.46
Gain/Steer (lbs/season)			
Winter	42	41	46
Summer	238	241	220
Year	280	282	266
Gain/acre	198	200	177

¹The summers of 1982 and 1983 were dry resulting in lower gains; gains from all varieties were similar during these dry summers.

Table 6. Stocking rates - Old World Bluestems.

	Forage Production (lbs/acre)		
	3000	5000	7000
Acres/Steer ^{1,2}			
yearlong	2.9	1.7	1.2
May - Sept.	1.1	0.6	0.4
Acres/Cow ³	4.8	2.9	2.0

¹ Assumes 70% utilization

² Steer consumes 15 lbs dry matter/day

³ Cow consumes 25 lbs dry matter/day

respectively. Steers fed good quality Caucasian bluestem hay, supplemented with adequate protein, gained over 2.2 lbs/day during winter feeding trials. WW-Spar bluestem hay, harvested after producing a summer seed crop, produced gains of 1.44 lbs/head/day in the same study.

Grazing Management

The amount of beef that can be produced from a pasture depends upon (a) the amount and quality of forage produced and (b) how efficiently the animals harvest the forage. As discussed previously, Old World bluestems can produce large amounts of forage when moisture and fertility requirements are met. Proper grazing management is necessary, however, to maximize the conversion of grass to beef. Grazing management incorporates such items as stocking rates, season of grazing, grazing distribution, and proper grazing system.

Continuous grazing offers good animal performance but tends to promote uneven (spot) grazing. Rotational grazing promotes better grazing distribution and forage utilization. Also, by providing alternating periods of grazing and rest, rotational grazing increases plant vigor, and subsequently higher forage production. As a result, beef gains per acre can be increased 10 to 25% by using some form of rotational grazing plan.

Rotational grazing involves subdividing a large pasture into smaller pastures, called paddocks. This is done most economically with electric fencing. The number of paddocks will vary, but most systems use 3 to 6 paddocks. Livestock are rotated throughout the paddocks as forage conditions dictate. Generally, when forage growth is rapid, movement is rapid (every 5 to 10 days), whereas when forage growth is slow, as during a drought, the speed of rotation is slower (every 3 to 5 weeks). This type of grazing maintains the grass at a higher growth rate and better forage quality than if grazed continuously.

Grazing should begin when grass reaches 12 to 18 inches in height and continue until the grass is grazed down to a 3 to 4 inch stubble height. Livestock are then rotated into the next pasture, and so on. The system should be designed so that animals will return to the first paddock in 4 to 6 weeks. Flexibility is critical in a rotational system. Livestock moves should be based on forage availability and maturity, not by a set number of days. After 6 to 8 weeks of growth, forage becomes mature and loses quality rapidly. If forage growth is too fast to keep pace with grazing, then that paddock should be harvested for hay. For more information on designing a rotational grazing system, see OSU Facts No. 2580 "Short Duration Grazing on Native Range", and OSU Facts No. 2867 "Differences Between Range and Introduced Pasture Management".

Forage Systems

Forage systems incorporate forages that complement each other to allow for maximum beef production from an area. Different forages are selected based on their growing season, production characteristics, and seasonal forage quality. Old World bluestems have good potential as a component of forage systems for the southern Great Plains. In western

Oklahoma, forage systems may utilize such forages as native range, weeping lovegrass, forage sorghums, alfalfa, bermudagrass, and small grain pastures in addition to Old World bluestems. For eastern Oklahoma, these forages plus others like annual and perennial clovers and tall fescue should be considered. Consult your local county extension office or Soil Conservation Service office for advice on planning the forage system best suited to your operation.

Wildlife Management Considerations

Old World bluestems have little value as food or cover for most species of wildlife and provide no biological diversity. However, Old World bluestems, in an ungrazed or lightly grazed condition, can provide escape cover for small game animals and birds such as cottontail rabbits and bobwhite quail. Since lease hunting has developed rapidly into a viable economic enterprise for many landowners, careful consideration should be given before planting large acreages of Old World bluestem if wildlife management is a consideration. A detailed land management plan should be developed before any grass planting begins.

Summary of Old World Bluestem varieties establishment, production, and persistence potentials.

	Plains	WW-Spar	WW-Iron Master	Caucasian	Ganada
Forage production	H	H	H	H	M
Steer gain	H	H	H	H	N
Stand establishment	H	H	M	M	H
Drought tolerance	M	H	M	M-L	M
Winter hardiness	M-L	M	M-H	H	H
Seed production	H	H	M	M	H
Tolerance to iron deficient soils	L	L	H	L	M
Basal spread for erosion control	M	M	H	L	H

H = High

M = Moderate

L = Low

N = No information

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